Claims: I claim:

1 A radio frequency excitation apparatus for exciting a spectroscopic sample, said spectroscopic sample emitting characteristic radiation which is dispersed to a sensor.

2 A radio frequency power oscillator means having a single resonant circuit including an an induction coil and a tuning capacitor, said induction coil in parallel with said tuning coil.

3 A plasma torch means, said induction coil externally and coaxially encircling a portion of said plasma torch means, said encircled portion of said plasma torch means defining a plasma forming region, said radio frequency power oscillator means exciting a plasma forming gas within said plasma forming region.

4 The vessel of claim 1 which provides a means for introducing a continuous high volume flow of waste effluent into said excited plasma emitting characteristic radiation.

5 A power supply means operatively connected to said radio frequency power oscillator means where power is transferred efficiently

6 A power transfer circuit method which does not require mechanical adjustment for different plasma operating pressure

7 A conductive media where radiation is conducted out of plasma container to sensor and detector where said radiation is converted from wavelengths to electrical signals.

8 A radio frequency excitation apparatus for exciting a spectroscopic sample, said spectroscopic sample emitting characteristic radiation, said apparatus comprising:

10 an outer tubular vessel opened at both ends, said vessel forming a bend where an optical window allows conductance of all spectral emissions to an optical analyzer

wherin said analyzer is comprised of an optical assembly containing a collection lens, a focusing lens, and slit.

11 a diffraction grating wherin said grating distributes said radiation across an optical detector

12 an optical detector which converts said radiation into electrical signals,

13 an electronic circuit where said electrical signals are converted into digital signals for computer based computations.

9

10 Procedure for forming a plasma , in which procedure an electromagnetic field is setup in a plasma forming space and a plasma is ignited without internal electrodes, and sustained by continuous power input. Wherein the applied power is manifested as an electrical and magnetic field transmitted through an insulating material. Wherein said plasma emits radiation when required for analysis. Wherby said analysis occurs whenever gas flows through said apparatus. Wherby said analysis is used to control process in a primary processing vessel.

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11 The said insulating material is comprised of ceramic with al203 composition greater than 95% and resistive to chemical attack.

11

12 The power is transferred through an electrical impedance matching circuit that does not require internal electrodes.

12

13 The power matching circuit does not require adjustment for different vessel operating pressures from below 100 mtorr to 10 torr.

13

14 The vacuum vessel diameters are sufficient to allow gas diffusion or flow at below atmospheric pressures.

14

15 The radio frequency power is applied continuously to decompose waste gas for analysis.

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16 The radiation signal levels in claim 10 are used to make system adjustments to process

conditions in the primary processing reactor.

16
~~17~~ The radiation signal levels in claim 10 are used to determine vacuum leaks in the primary processing reactor.

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~~18~~ The radiation signal levels in claim 10 are used to modify determine end of process in the primary processing reactor.

18
~~19~~ The radiation signal levels in claim 10 are used to initiate process in the primary processing reactor

19
~~20~~ The radiation signal levels in claim 10 provide a means to verify and modify controls used in the primary processing reactor.

add a' 7